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How to set up a Peltier Module.

by **Roboto TU** on December 17, 2015

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Intro: How to set up a Peltier Module.

In this Instructable it is shown how to set up a Peltier component via an Arduino board. The instructable will consist of an introduction of the technology and the Arduino setup including general advice for using the unit.

The Arduino setup will consist of the Peltier unit, on/off button and a verification light. An example for an application for using this set up is a drink heater and cooler.

This Instructable is made for the course TfCD.
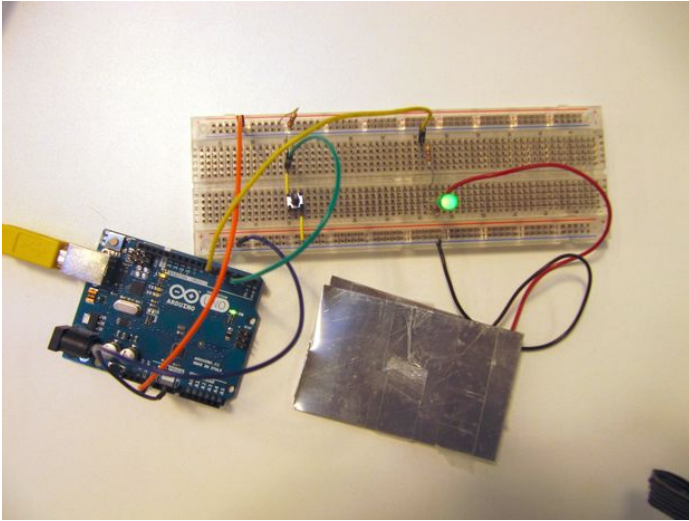
Step 1: The Peltier Effect

As one of the thermo-electric effects, the Peltier effect can be very convenient for various products. The Peltier effect converts electric voltage into a change in temperature. Because there are two dissimilar conductors into the circuit one junction of the unit will be cooled and the other will be heated. This effect is even stronger with two dissimilar semiconductors.

Peltier effect is commonly used as coolers, mainly for cooling electronic components and small instruments. It can be found on coolers for food and beverages, suitable for car or campers. Peltier coolers are currently replacing fan to cool CPU.

In general, Peltier cooling technology uses no motors or compressors, so it operates noiselessly. It does not contain refrigerants which are harmful to the ozone layer or contributing to greenhouse effect. In addition, it's reliable, small-sized and maintenance-free. Component can be easily replaced when it's not working properly. And it is possible to more accurately adjust the cooling effect than conventional compressors. One interesting aspect is the cooling function can be turned into heating by simply reversing the polarity. However, challenges Peltier cooling technology faces is efficiency and limited temperature differences. By now, the efficiency of Peltier cooling is only around 5% or so, which is lower than compressors.

In the near future, Peltier effect will mainly be adopted on small or portable devices considering its small size and simple components. Wearable devices can be an attractive option, such as jackets, smart watches etc. In addition, due to its high accuracy, it can be adopted on delicate devices which require certain temperatures to operate smoothly. Restricted by its low efficiency, it is however not possible to adopt Peltier modules on household refrigerators to completely replace traditional compressor cooling systems for now.
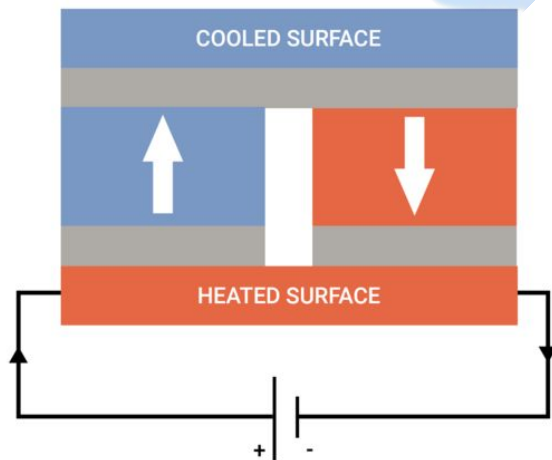
## Step 2: Arduino Setup: Components

The components used in the Arduino setup are:

1. An Arduino board (UNO is used in this case)
2. A breadboard
3. A push button
4. A Peltier module
5. Two 100? resistors
6. An LED
7. A few wires
8. Two small metal plates
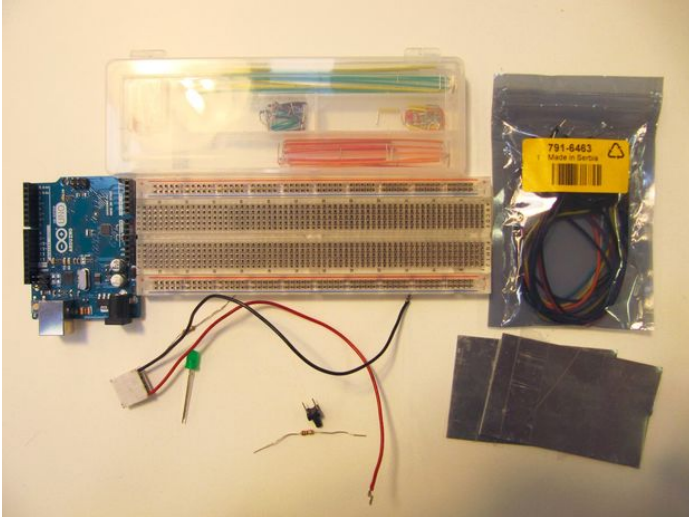
Step 3: Arduino Setup: Connect button control circuit

1. Install a 100? resistor and push-button on the breadboard, connect them with a jumper wire.
2. Connect the 5V pin (orange line) and the GND pin (blue line) to enclose the circuit.
3. Choose a point between the button and the resistor, insert one end of a wire (green line) into it, and connect the other end of the wire into digital Pin 3.
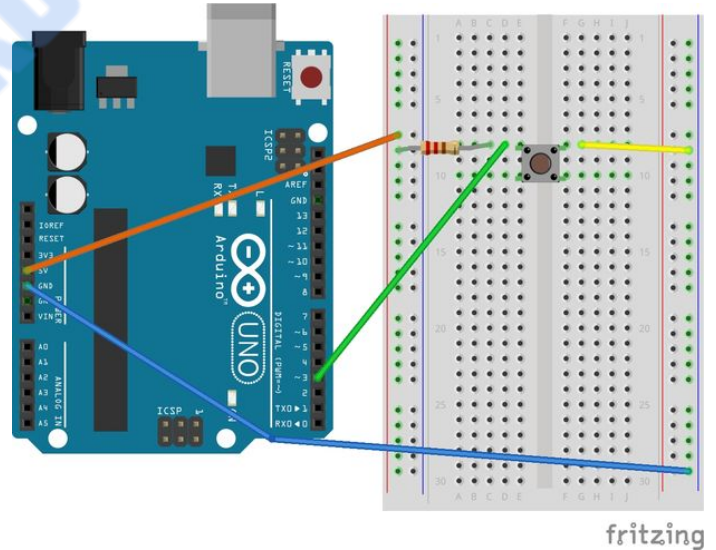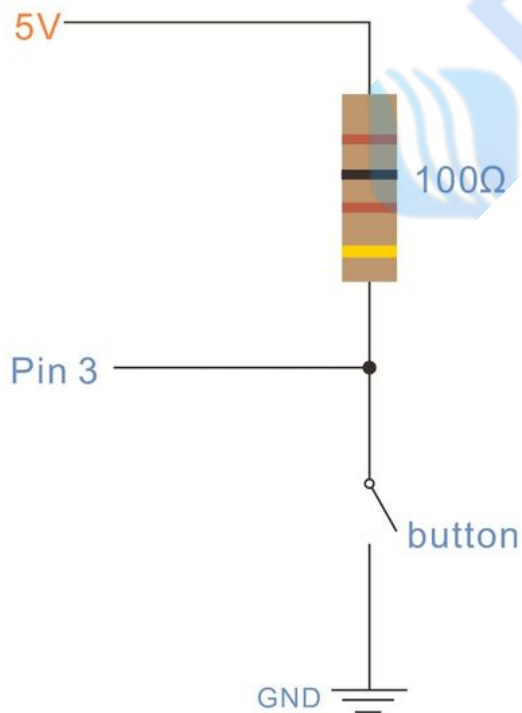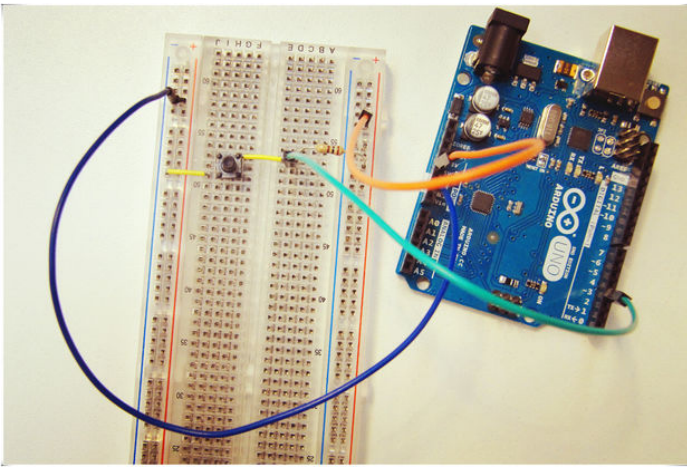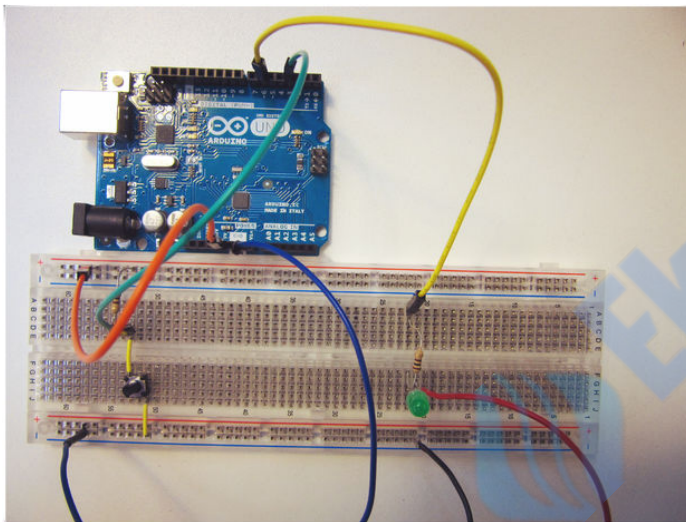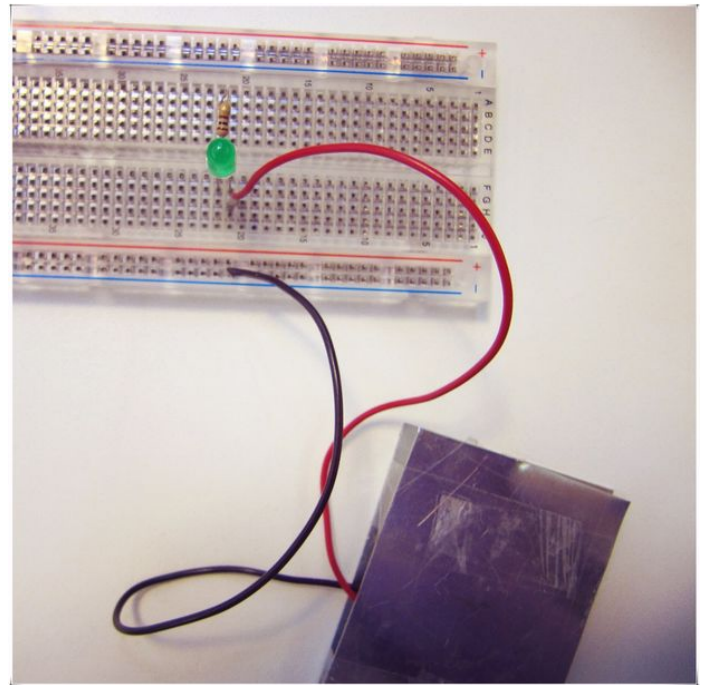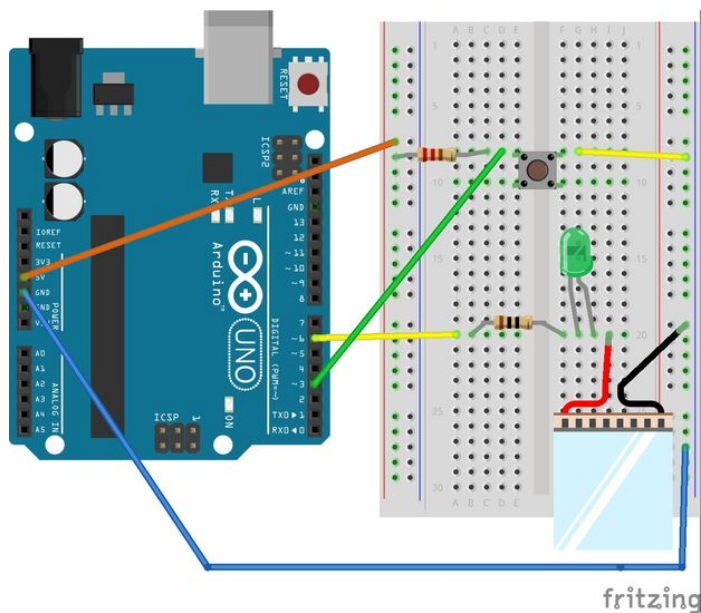
Step 4: Arduino Setup: Connecting the Peltier unit

1. Put the Peltier module between two metal plates. The module should be placed in between the two plates to guide the heat away from the module. Also, a bit of thermal paste should be used between the module and metal plates. This is not recommended to do if you are still trying things out with it, as it is not fully safe.
2. Install Peltier module, resistor and LED to the breadboard.
3. Connect them with jumper wire.
4. Connect positive side to Digital Pin 6 (yellow line), which is a PWM pin.
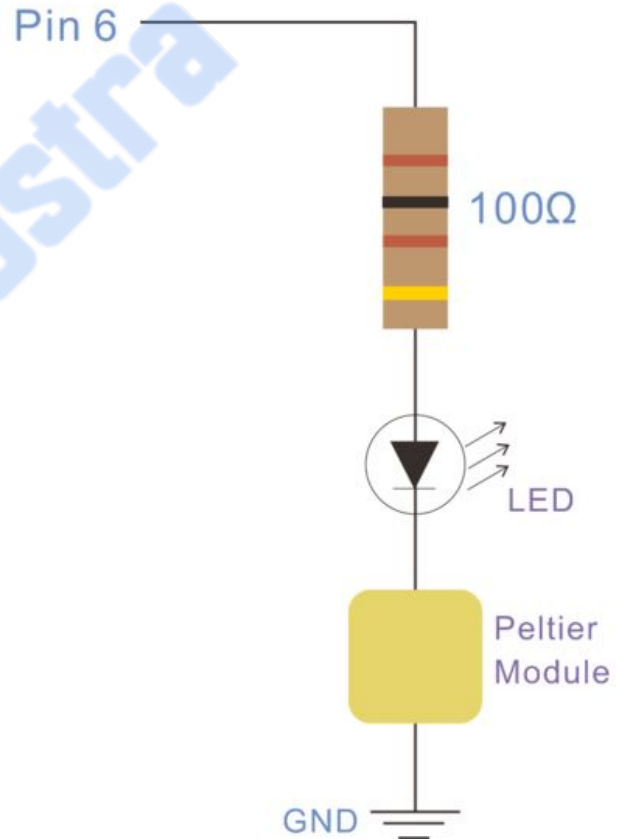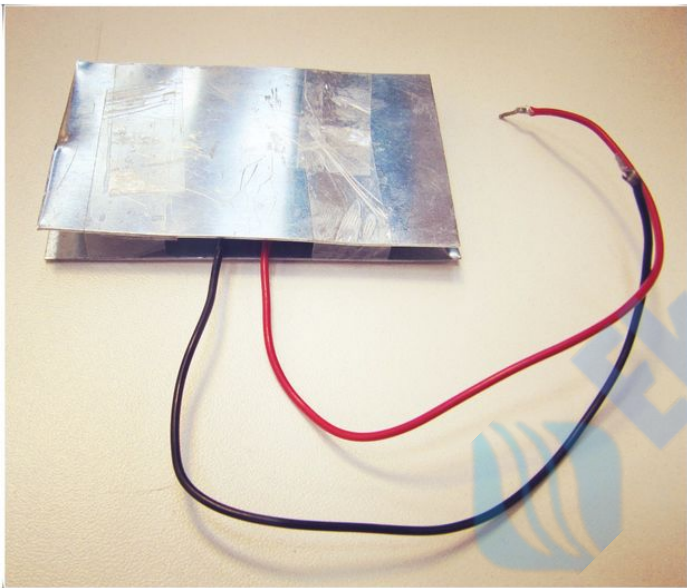
Step 5: Arduino Setup: Coding

Next add import the coding to the Arduino setup.

When writing the code be careful to not sent to much voltage towards the Peltier module. The amount it can handle should be in the product description of the bought unit.

The used in this setup is written below:

```
int buttonPin = 3;
int buttonInput = 1;
int buttonState = 0;
int peltier = 6;

void setup() {

pinMode(buttonPin, INPUT);

}

void loop() {

buttonInput = digitalRead(buttonPin);

if (buttonInput == 0) {

if (buttonState == 0) {

buttonState = 1;
```

```
} else {

buttonState = 0;

}

delay(500);

}

if (buttonState == 1) {

analogWrite(peltier, 120); // Look first on how much voltage your peltier unit can handle 255 = 5V

} else {

analogWrite(peltier, 0);

}

delay(500);

}
```

Step 6: Arduino Setup: Upload the Arduino code and play!

1. Click on the Upload button in the Arduino software, to compile and upload the code
2. When pressing the button down for the first time, LED is turned on and Peltier module starts to work. After several minutes, you can feel the temperature differences between two plates.
3. After pressing the button again, the LED light turns off. Peltier module stops working.

Turning the setup on and off repeatedly over a short amount of time can be damaging for the Peltier unit! So try to wait a few minutes in between.
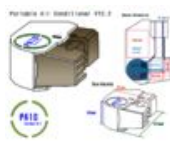
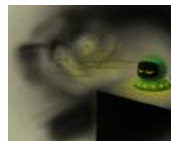The setup should now be complete.
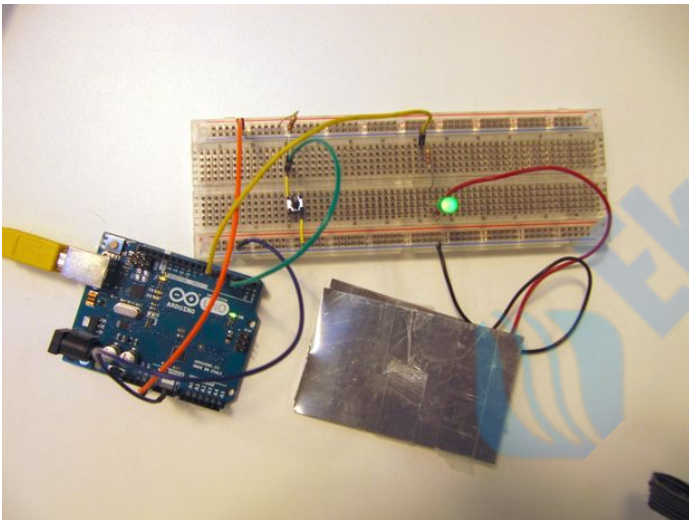
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DIY Hacks and How Tos says:
Dec 17, 2015. 7:44 AM **REPLY**

Nice setup. If you want to get a little more heat transfer out of the peltier module, you can control it with a power transistor. This will let you get more current than the digital pins can provide.